Forest values and attitudes of the public, environmentalists, professional foresters, and members of public advisory groups in Alberta

B.L. McFarlane and P.C. Boxall

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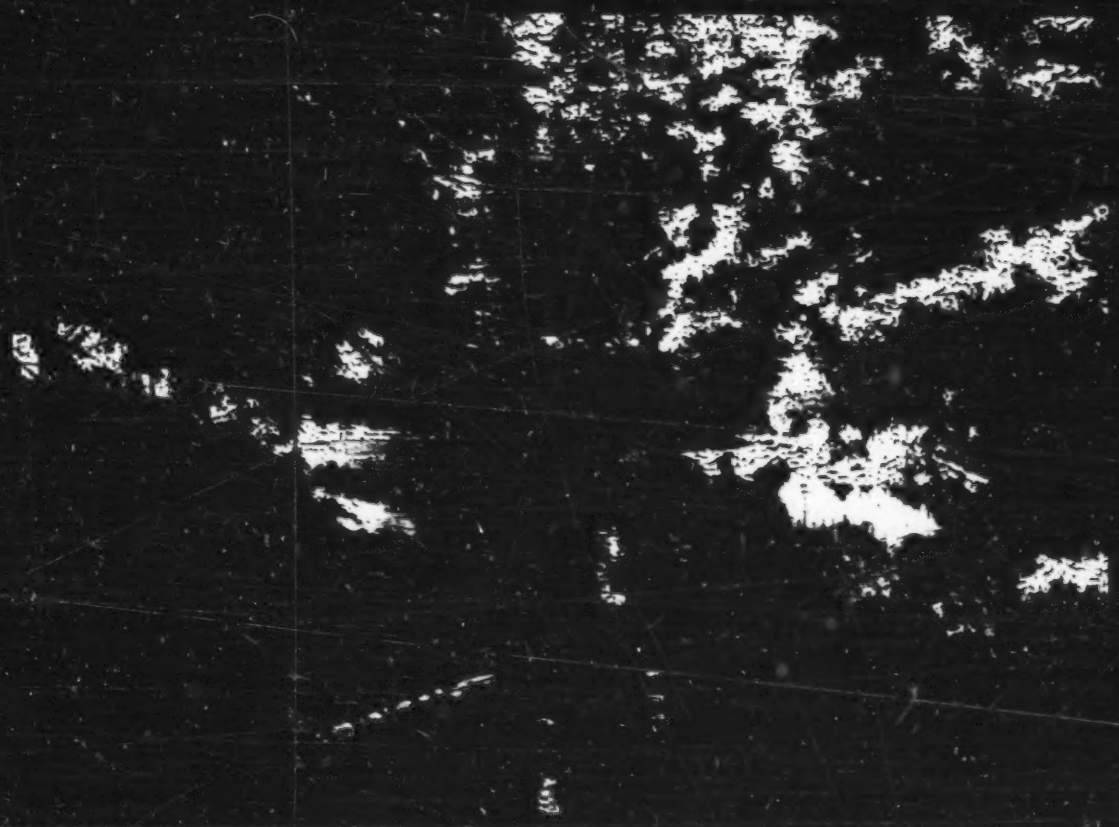

foothills

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Le Service canadien des forêts de Ressources naturelles Canada est également partenaire principal de chacune des onze forêts modèles, et il fournit l'essentiel du financement et de l'appui administratif au programme des forêts modèles du Canada.

La forêt modèle Foothills est un partenariat extraordinaire devoué à fournir des solutions pratiques envers la gestion durable de nos forêts.

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ABSTRACT

This report provides a descriptive analysis of selected forest values, attitudes toward sustainable forest management, and knowledge and socioeconomic characteristics of four stakeholder groups in Alberta: the public, environmentalists, professional foresters, and forest-industry public advisory groups (PAGs). Data were collected by mail surveys in 1999. The groups had different socioeconomic characteristics and disparate value orientations and attitudes toward forest management. Members of the public and environmentalists were more supportive of the inherent worth of the forest, the rights of nature, and allowing natural processes to occur. These two groups also believed that timber supply and the inclusion of multiple benefits in forest management are inadequate, that forestry is damaging the environment, and that the public does not have enough input in forest management. Professional foresters and PAG members were more supportive of manipulating forests for economic benefit and human use and generally had a more optimistic view of the sustainability of forest management.

RÉSUMÉ

Ce rapport est une analyse descriptive de certaines valeurs liées à la forêt, de certaines conceptions de la gestion forestière, ainsi que des connaissances et des caractéristiques socioéconomiques associées à quatre groupes d'intérêts de l'Alberta : le public en général, les écologistes, les forestiers et les groupes consultatifs industrie-public. Les données ont été recueillies par divers sondages postaux effectués en 1999. Les quatre groupes présentaient des caractéristiques socioéconomiques distinctes et avaient des conceptions divergentes de la gestion forestière. Ainsi, les membres du public en général et les personnes qui s'identifient comme écologistes souscrivent aux notions de valeur intrinsèque de la forêt, de droits de la nature et de respect de l'intégrité des processus naturels. Ces deux segments de population sont également d'avis que les réserves de bois et la prise en compte d'intérêts multiples en matière de gestion forestière sont inadéquates, que l'exploitation forestière porte atteinte à l'environnement, et que les citoyens ne sont pas suffisamment consultés en matière de gestion forestière. Par contre, les forestiers et les membres de groupes consultatifs industrie-public croient davantage à la validité de l'intervention humaine en matière de forêt pour tirer de celle-ci des bénéfices économiques et autres, et ont un point de vue plus optimiste de la viabilité du concept de gestion forestière.

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NOTE

The exclusion of certain manufactured products does not necessarily imply disapproval nor does the mention of other products necessarily imply endorsement by Natural Resources Canada.

The Foothills Model Forest (FMF) is 1 of 11 model forests established across Canada as a means of promoting sustainable forest management for a variety of ecosystems and social situations. The FMF is a nonprofit corporation representing a range of partners dedicated to the sustainability of its forested lands. The land base for which the partners have authority comprises over 2.75 million ha of primarily publicly owned land in the Rocky Mountains and eastern slopes region of west-central Alberta. Resource extractive activities on the land base include industrial forestry operations, coal mining, and oil and gas developments. Spectacular scenery in the Rocky Mountains and a wealth of recreational opportunities make the area a primary destination for many tourists and recreational users. Several resource-dependent communities are situated in or near the model forest; the two largest of these are Hinton and Jasper, which in 1996 had populations of 9961 and 4301, respectively (Statistics Canada 2000).

Achieving sustainability on a land base with such varied and sometimes conflicting uses requires an understanding and integration of the biological and social systems affecting these lands. The understanding of biological systems derives from scientific facts about forest ecosystems and other aspects of the natural world. It is the social systems, however, that determine which of these facts have relevance and how forests will be managed (Bengston 1994). Thus, to achieve sustainable forest management it is imperative to identify relevant stakeholder groups and their values and attitudes, and to assess how these groups will be affected by management decisions.

Through earlier studies in the FMF, researchers have developed models to determine the economic impact of management and policy scenarios (Alavalapati et al. 1999), identified indicators of community sustainability (Parkins and Beckley n.d.), reviewed existing mechanisms for public involvement, and examined the forest value orientations and attitudes toward forest management of two recreational stakeholder groups, campers and hunters (McFarlane and Boxall 1999). The current study extends the earlier research on forest value orientations and attitudes to four more stakeholder groups: the general public of Alberta, members of environmental organizations, registered professional foresters (RPFs), and members of forest-industry public advisory groups (PAGs). The study addresses the following questions: What are the forest value orientations of these stakeholders? What are the stakeholders' attitudes toward sustainable forest management? What do these groups perceive as the long-term threats to forests in Alberta? How knowledgeable are stakeholders about forest management issues and basic forest-related facts? Do these stakeholders share similar forest value orientations, attitudes, perceptions of threats, and knowledge? Are the forest value orientations, attitudes, perceptions of threats, and knowledge of FMF residents similar to those of other Alberta residents?

Forest Values

Forest management in Canada has changed over time. At the beginning of the 20th century, it was based on the desire for sustained timber yield and economic development. Economic values expressed in the marketplace were the dominant social values considered in management and policy. More recently, the public has become increasingly dissatisfied with this approach. Growing environmental awareness, concern over natural resource management, and the desire for multiple uses and benefits from the forest have led to a new management paradigm. This new paradigm, called sustainable forest management, strives to manage for ecosystem conditions (not just timber) and for a range of social values and benefits (not just the economic values of extractive enterprises).

The shift from one forest management paradigm to another reflects changing societal values. The use of forests for products and services that satisfy human wants and needs dominated the timber-yield paradigm. These values define forests in terms of the resources they provide for humans, such as forest products, employment, and life support functions, and are referred to as instrumental, anthropocentric or human-centered values (Bengston 1994; Steel et al. 1994; McFarlane and Boxall 1999). The sustainable forest management paradigm reflects a broader range of values, including noninstrumental or biocentric values. Biocentric values recognize nature as having inherent worth and a right to exist for its own sake. Forests are valued regardless of their usefulness to humans. When forests are managed for biocentric values the naturally occurring qualities of the forest are emphasized, and human manipulation or

intervention in natural processes is minimal. Although human uses and benefits are considered, they are not necessarily the primary management goal.

Biocentric and anthropocentric values are referred to as "held values". These held values reflect an individual's general beliefs about forests and have been defined as relatively enduring conceptions of the good related to forests and forest ecosystems (Bengston 1994). Held values form the basis of a person's attitudes and forest management preferences. The relationship between values and attitudes, however, is complex. Many potentially acceptable management options or policies can be represented by a particular value orientation. Each management option or policy will have impacts that are not necessarily distributed equitably across society. It is the trade-offs among the potential options and their impacts that represent the decisions faced by forest managers and policymakers. Although values and attitudinal information do not allow a formal analysis of trade-offs, they can provide guidance in developing broad-based management goals and policies.

The biocentric–anthropocentric dichotomy has been used as an indication of the management philosophy that might be accepted (Steel et al. 1994; McFarlane and Boxall 1999), as well as for predicting management preferences and beliefs about forest management (McFarlane and Boxall 2000) and categorizing stakeholders on the basis of their value orientation (Steel et al. 1994; McFarlane and Boxall 1999). By understanding the held values of various stakeholders, managers can predict how they might react to management practices, why they react the way they do, and which groups will be affected by management changes. Such analysis can, in turn, allow an improved understanding of potential sources of conflict among stakeholder groups (Bengston 1994). If forest management and policy are to reflect societal values and if conflict among stakeholders is to be reduced, it is necessary to monitor held values to identify changes in various stakeholders' values, identify factors that influence values, and be able to predict which values might dominate in the future.

Identifying Stakeholders

In addition to the shift in the types of values that are considered important to forest management, there has been a shift in perceptions of who should have input into forest management and policy. In the timber-yield paradigm professional foresters and other experts in governments and the forest industry were the dominant stakeholders. The definition of stakeholders has been expanded under the sustainable forest management paradigm to include both users and non-users of the forest (Beckley et al. 1999). In the case of crown land, which is managed for the public good, each citizen should have a legitimate voice in its management. However, involving every citizen in the intimate details of land management is difficult. Nonetheless, the concerns of a broad range of citizens can be included at the philosophical approach and goal-setting stages of forest management. Identifying held values through survey research techniques is one method of gathering public input to determine social values, which can be used to define broad management goals and priorities.

The interests of citizens are often assumed to be represented by organized groups such as environmental organizations, labor unions, and chambers of commerce, and politically through local, provincial, or federal governments. Other, more direct means of involving stakeholders have included advisory committees, open houses, petitions, personal letters, form letters, and workshops. These mechanisms have been criticized because they often elicit input from special interest groups who may not be representative of most stakeholders (Heberlein 1976; Dennis 1988; Force and Williams 1989). To optimize public participation in forest management and planning, a variety of techniques should be used (Beckley et al. 1999). Survey research is one means to complement existing methods of public involvement and to obtain, relatively inexpensively, an understanding of forest values and attitudes across a range of stakeholders. Survey research can assess the representativeness of the relevant populations of interest and can provide a common metric for comparing values across stakeholder groups.

Stakeholders

Four groups of stakeholders were chosen for the study: the Alberta general public, members of environmental groups, RPFs, and members of PAGs. These groups were chosen to represent a range of stakeholders with a variety of interests in forest management in Alberta. The general public was chosen because most of the forested land in Alberta is crown land; thus, each citizen can be considered a stakeholder. Environmental groups were chosen because they are often asked by governments and industry to provide advice and input on environmental issues, and they are often intervenors in environmental impact assessment hearings. However, they are also viewed by many as an elite component of society whose interests are not representative of the general public. Registered professional foresters represent the forestry profession and thus have considerable influence in making and interpreting policy and recommending and implementing forest management practices; for these reasons, they have been identified as the most critical Canadian stakeholder group to understand (Beckley et al. 1999). Public advisory groups were chosen because they advise the forest industry on forest management plans and activities. Public advisory group membership usually represents a variety of community-based organizations such as chambers of commerce, trappers, recreation groups, and environmental advocates. Some PAGs also include members from the public at large. Public advisory groups are usually the main forum for public involvement for the forest industry in Alberta.

The sample for the general public was obtained by random selection of telephone numbers. To allow comparisons between FMF residents and other residents in the province, the communities in or near the FMF (Brûlé, Cadomin, Edson, Grande Cache, Hinton, Jasper, and Robb) were oversampled. For making generalizations about the general public, data were weighted in the analyses to account for the overrepresentation of model forest residents in the sample. Respondents had to be 18 years of age or older, and interviewers alternated between male and female respondents. A total of 3048 people were contacted and participated in a short telephone survey. Of these respondents, 2000 agreed to participate in a follow-up mail survey (400 of these lived in the model forest area). The 2000 respondents were randomly assigned to receive one of two surveys: one on forest values and attitudes or one on public involvement. Thus, each mail survey had a sample of 1000. This study reports the results of the forest values and attitudes survey.

The surveys for the general public were mailed in June 1999. Ten days later a reminder postcard was sent, and 1 month after the initial mailing a second reminder and survey were sent to those who had not responded. Two weeks later, a final letter was sent to nonrespondents.

To represent environmental groups, 100 members from each of the Federation of Alberta Naturalists, the Western Canada Wilderness Committee, and the Alberta Wilderness Association were chosen at random from the mailing lists of these associations. One hundred and fifty RPFs were chosen at random from the mailing list maintained by the Alberta Registered Professional Foresters Association. Surveys were mailed to these two groups in September 1999, with a reminder postcard sent 10 days later and a second survey sent 6 weeks later.

About 160 surveys were sent to members of 11 of the 12 PAGs that existed in the province in mid-1999. Implementation of the survey for the PAG members differed from that of all the other stakeholders. Rather than being mailed, the surveys were distributed by the coordinators of each PAG to their respective members in August 1999. Only 4 coordinators distributed reminder letters to their members. No further follow-up with PAG members was possible.

The Questionnaire

All stakeholders, except the PAG members, received the same questionnaire. In addition to collecting value and attitudinal information, the PAG survey contained more detailed questions on public involvement. To reduce the response burden, one attitudinal question was omitted from the PAG survey.

Socioeconomic Characteristics

Information was collected on each respondent's age, gender, education, and total household income. Affiliation with interest groups was determined by membership in any conservation-related

organization and by dependence of a household member on a natural resource sector for his or her livelihood. Dependence was determined by asking respondents if anyone in their household depended upon the forest, mining, or oil and gas industry or a natural resource agency for his or her livelihood.

Forest Values

Two approaches were taken to examining forest values. First, respondents' perceptions of forest values were examined by a ranking of forest benefits. Respondents were asked to rank three broad categories of forest benefits (environmental, economic, and social) from most to least important. Second, a forest values scale based on previous values studies in Alberta (McFarlane and Boxall 1996; McFarlane and Boxall 1999) was used to measure biocentric and anthropocentric orientations toward forests. Biocentric statements reflected existence value, the spiritual significance of forests, and the inherent values and rights of nature. Anthropocentric statements reflected the use of forests to benefit humans. Respondents rated 16 statements on a five-point scale ranging from strongly disagree to strongly agree.

Attitudes toward Forest Management

Two approaches were taken in examining attitudes toward forest management. First, statements were developed to determine beliefs about specific aspects of sustainable forest management: managing for multiple benefits, the sustainability of timber supply, the economic benefits of forestry, and public involvement. Respondents were asked to rate 14 statements on a five-point scale ranging from strongly disagree to strongly agree. Second, perceptions of long-term threats to Alberta's forests were examined. These ranged from natural disturbances such as forest fires to human-induced changes such as climate change and conversion of land to agriculture or urbanization. Respondents rated 10 potential threats on a four-point scale ranging from not a threat at all to a great threat. This question was the one not included in the survey of PAG members.

Knowledge of Forests and Forest Management

Respondents' familiarity with basic forest-related facts was determined by means of questions contained in Treevia, a forest trivia game produced by the Canadian Council of Forest Ministers, and questions developed by consulting experts in forest management. Respondents were asked to mark 10 statements as true or false, or to indicate that they were not sure. A composite knowledge score was calculated for each respondent by summing the number of correct responses.

Respondents also rated how well informed they thought they were on forest management issues in Alberta. Ratings were based on four categories ranging from not at all informed to very well formed.

Segmentation Analysis

Cluster analysis was used to classify stakeholders on the basis of their forest value orientations. With cluster analysis, individuals sharing similar attributes are grouped into clusters or segments. To reduce the number of variables to a manageable size for the cluster analysis, the 16 value statements underwent factor analysis by means of maximum likelihood analysis with varimax rotation. The factor analysis identified two factors corresponding to anthropocentric and biocentric value orientations. To segment the respondents, a discrete cluster analysis was performed on the resulting factor scores (FASTCLUS procedure, SAS Institute Inc. 1999). A biocentric and anthropocentric score was calculated for each segment by summing the statements that corresponded with each factor.

RESULTS

Response Rates

After adjustment for invalid addresses, the response rates were as follows: for the general public, 74.0% (715/966); for environmental groups, 76.0% (209/275); for RPFs, 73.0% (109/148); and for PAGs, 45.0% (71/160).

Socioeconomic Characteristics

One means of comparing stakeholders is to compare their socioeconomic characteristics. The RPFs were distinguishable from the other groups because they were younger and better educated, had higher household incomes, included fewer

women, and included fewer individuals living in Edmonton or Calgary (Table 1). Information on place of residence was not available for PAG members, but it is reasonable to assume that Edmonton and Calgary residents constituted a negligible proportion of members because PAGs are confined to communities with a forest industry.

The PAG sample was distinguishable from the other groups by having fewer women and higher educational achievement than the public and less education than RPFs or environmentalists. This group had higher incomes than the public and the environmentalists. The environmental group differed from the other groups by having considerably more women than the RPFs and PAG members but fewer women than the general population. This group was not as well educated as the RPFs and had lower household incomes than the RPFs and PAG members, but they were better educated and had higher household incomes than the public. The public sample included fewer people with some university education, and they had lower household incomes than all of the other groups.

Forest Value Orientations

The groups tended to agree (mean rating > 3.0) with statements relating to biocentric values such as existence values, inherent worth, and spiritual values (Table 2). The public and environmental groups, however, scored higher on most of these statements than the RPF and PAG groups, which indicated their higher level of support for biocentric values. In terms of economic and utilitarian values, all groups agreed that if forests are not threatened they should be used to add to the quality of human life. Only the environmental group did not agree (mean < 3.0) that forests should be managed to meet as many human needs as possible and that forests can be improved through management. The RPF and PAG groups scored higher than the public and environmental groups on four of the six economic and utilitarian statements, which indicated a higher level of support for anthropocentric values.

The cluster analysis segmented the stakeholders into three clusters or segments. The clusters were assigned names based on the mean scores of statements corresponding to the anthropocentric and biocentric factors (Fig. 1): Human-centered, Biocentric, and Moderate.

The Human-centered Segment, which accounted for 25.7% (283) of the respondents, could be described as supporting biocentric values such as the spiritual aspects of forests, existence values, and the rights of nature. However, members of this group also supported the use of the forests for such things as products and services and enhancing the quality of human life. This is the only segment for which the mean score on the anthropocentric factor was greater than 3.0, which indicates agreement with the anthropocentric statements. The Biocentric Segment accounted for 31.8% (351) of the respondents. Respondents in this segment believed that nature should be the dominant player in forests and did not support human intervention in nature or using the forests for human benefit. The Moderate Segment (42.4% [467] of respondents) was almost identical with the Biocentric Segment in terms of its support of the spiritual aspects of forests, existence values, and the rights of nature. Respondents in the Moderate group, however, scored about neutral on anthropocentric values, which indicated that they lacked the strong disagreement with using forests exhibited by the Biocentric Segment.

Stakeholder Values

The distribution of the three value segments among the four stakeholder groups (Fig. 2) shows that the public has a wider range of value

Table 1. Socioeconomic characteristics of stakeholder groups

Characteristic	Public	(*n*)	Environmentalists	(*n*)	RPFs	(*n*)	PAG members	(*n*)	F/χ^2 value	*p*
Mean age[a] (yr)	46.0a	(692)	50.6b	(196)	42.3c		48.0ab	(63)	10.11	0.0001
Women (%)	52.3	(708)	44.0	(200)	7.4	(108)	17.1	(70)	98.97	0.001
Some university education (%)	31.1	(713)	78.9	(209)	96.3	(109)	63.4	(71)	270.28	0.001
Household income ≥ $70 000 (%)	26.2	(713)	38.8	(209)	61.5	(109)	49.3	(71)	66.08	0.001
Edmonton or Calgary residents (%)	45.5	(713)	51.2	(209)	32.1	(109)	NA		66.38	0.001

[a] Any two means that do not share a letter are significantly different ($p < 0.05$) according to Tukey's highly significant difference test.

Note: RPF = registered professional forester, PAG = forest-industry public advisory group, NA = not available.

Table 2. Forest value scores of stakeholders[a]

Value category and statement	Mean rating[b] (standard deviation) Public	*n*	Environmentalists	*n*	RPFs	*n*	PAG members	*n*
Existence values								
Whether or not I get to visit the forest as much as I like, it is important for me to know that forests exist in Alberta	4.9 (0.5)ab	706	4.9 (0.5)a	209	4.7 (0.6)b	108	4.9 (0.3)a	71
It is important to maintain the forests for future generations	4.9 (0.5)	709	4.9 (0.4)	209	4.9 (0.4)	109	4.9 (0.4)	71
Inherent worth								
Forests should have the right to exist for their own sake, regardless of human concerns and uses	3.9 (1.2)a	694	4.4 (0.9)b	207	3.5 (1.3)c	104	3.3 (1.4)c	71
Forests should be left to grow, develop, and succumb to natural forces without being managed by humans	2.9 (1.3)a	696	3.4 (1.2)b	207	1.6 (0.9)c	109	1.8 (1.1)c	70
Wildlife, plants, and humans should have equal rights to live and develop	4.0 (1.2)a	696	4.1 (1.1)a	208	3.2 (1.4)b	107	3.5 (1.3)b	71
Spiritual values								
Forests are sacred places	3.5 (1.3)a	701	3.6 (1.3)a	205	2.7 (1.2)b	109	3.0 (1.4)b	70
Forests give us a sense of peace and well-being	4.6 (0.7)a	700	4.7 (0.6)a	208	4.3 (0.8)b	108	4.5 (0.8)ab	71
Forests let us feel close to nature	4.6 (0.7)ac	700	4.7 (0.6)a	209	4.2 (0.8)b	108	4.5 (0.7)c	71
Forests rejuvenate the human spirit	4.2 (0.9)a	676	4.5 (0.8)b	206	3.8 (0.9)c	103	4.0 (1.1)ac	69
Humans should have more respect and admiration for the forests	4.7 (0.7)a	704	4.7 (0.6)a	207	3.7 (0.9)b	105	4.3 (0.8)c	70
Economic or utilitarian values								
Forests should be managed to meet as many human needs as possible	3.5 (1.4)a	696	2.7 (1.4)b	204	3.9 (1.2)c	109	4.0 (1.2)c	70
If forests are not threatened by human actions, we should use them to add to the quality of human life	4.1 (1.0)a	674	4.1 (1.1)a	199	4.2 (1.0)a	98	4.2 (1.1)a	71
Forests that are not used for the benefit of humans are a waste of our natural resources	1.7 (1.2)a	704	1.4 (0.9)b	209	2.1 (1.2)c	108	2.3 (1.4)c	71
Forests can be improved through management by humans	3.9 (1.1)a	688	2.9 (1.3)b	202	3.9 (0.9)a	105	3.8 (1.2)a	71
Forests should exist mainly to serve human needs	2.1 (1.2)a	692	1.7 (1.0)b	208	2.6 (1.2)c	108	2.5 (1.3)c	70
The primary function of forests should be for products and services that are useful to humans	2.1 (1.3)a	699	1.6 (1.0)b	204	2.9 (1.3)c	108	2.6 (1.3)c	71

[a] Rated on a scale of 1 to 5, where 1 = totally disagree and 5 = totally agree.

[b] Any two means in a given row that do not share a letter are significantly different ($p < 0.05$) according to Tukey's highly significant difference test.

Note: RPF = registered professional forester, PAG = forest-industry public advisory group.

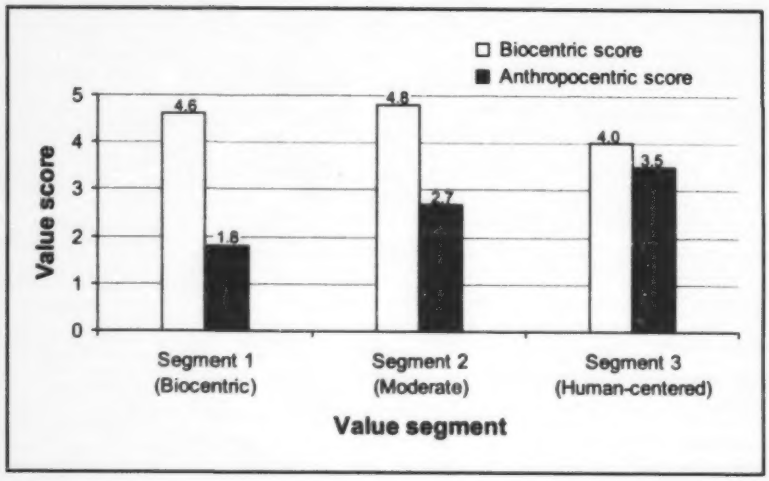

Figure 1. Forest value scores for values segments.

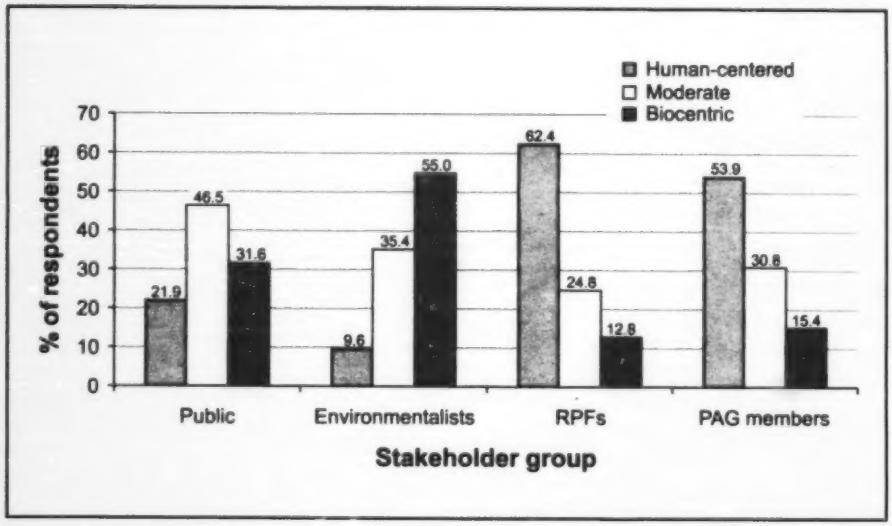

Figure 2. Distribution of forest value segments among stakeholder groups. RPF = registered professional forester, PAG = forest-industry public advisory group.

orientations than the other stakeholder groups: nearly half of the public respondents were in the Moderate Segment, about one-third were in the Biocentric Segment, and about 20% were in the Human-centered Segment. More than half of the environmental group were in the Biocentric Segment, but fewer than 10% were in the Human-centered Segment. In contrast, the majority of both the RPF and PAG groups were in the Human-centered Segment. The proportions of RPFs and PAG members in the Moderate and Biocentric segments were much lower. Clearly, the RPFs and PAG members were more anthropocentric than the other stakeholders.

Ranking of Forest Benefits

All stakeholder groups ranked environmental benefits such as clean air and water and wildlife habitat as the most important benefits of the forest (Table 3). However, considerably fewer RPFs and

Table 3. Ranking of environmental benefits

Ranking	% of respondents			
	Public (n = 656)	Environmentalists (n = 204)	RPFs (n = 109)	PAG members (n = 70)
1	83.1 (545)	96.6 (197)	54.1 (59)	61.4 (43)
2	13.1 (86)	2.9 (6)	37.6 (41)	34.3 (24)
3	3.8 (25)	0.5 (1)	8.3 (9)	4.3 (3)

Note: RPF = registered professional forester, PAG = forest-industry public advisory group.

Table 4. Ranking of economic benefits

Ranking	% of respondents			
	Public (n = 664)	Environmentalists (n = 201)	RPFs (n = 109)	PAG members (n = 69)
1	13.7 (91)	2.5 (5)	42.2 (46)	39.1 (27)
2	41.7 (277)	42.3 (85)	48.6 (53)	39.1 (27)
3	44.6 (296)	55.2 (111)	9.2 (10)	21.8 (15)

Note: RPF = registered professional forester, PAG = forest-industry public advisory group.

Table 5. Ranking of social benefits

Ranking	% of respondents			
	Public (n = 633)	Environmentalists (n = 199)	RPFs (n = 109)	PAG members (n = 69)
1	5.2 (33)	1.5 (3)	3.6 (4)	4.3 (3)
2	46.1 (292)	55.3 (110)	13.8 (15)	26.1 (18)
3	48.7 (309)	43.2 (86)	82.6 (90)	69.6 (48)

Note: RPF = registered professional forester, PAG = forest-industry public advisory group.

PAG members ranked this benefit first. The RPFs and PAG members placed greater importance on economic benefits, such as wealth and jobs, than the other groups did (Table 4). Few respondents ranked social benefits such as recreation and relaxation first (Table 5). However, the public and the environmentalists placed more importance on these benefits than did the RPF and PAG groups.

Attitudes toward Sustainability

Overall, there were substantive differences between the groups in terms of their attitudes toward sustainable forest management. Generally, the public and the environmentalists believed that timber supply and the inclusion of multiple benefits in forest management are inadequate and that the public does not have enough input in forest management decisions. Registered professional foresters and PAG members had a much more optimistic view, generally believing that timber supply is adequate and that multiple benefits are considered in forest management.

All groups except the environmentalists agreed that forests are being managed successfully for a wide range of values and that forest management does a good job of including environmental concerns (Table 6). However, both the public and the environmentalists disagreed that the province of Alberta has enough protected areas, that forests are being managed successfully for the benefit of

Table 6. Attitudes of stakeholders toward forest management[a]

Attitude category and statement	Mean rating[b] (standard deviation)							
	Public	*n*	Environmentalists	*n*	RPFs	*n*	PAG members	*n*
Multiple benefits								
Forests are being managed successfully for a wide range of uses and values, not just timber	3.3 (1.1)a	698	2.5 (1.2)b	206	3.8 (1.0)c	108	3.7 (1.3)ac	71
Forest management does a good job at including environmental concerns	3.2 (1.2)a	698	2.2 (1.1)b	206	3.7 (1.0)c	108	3.6 (1.2)c	71
Alberta has enough protected areas such as provincial and national parks or wilderness areas	2.7 (1.4)a	702	1.6 (1.0)b	207	3.3 (1.4)c	108	3.1 (1.5)ac	71
Forests are being managed successfully for the benefit of future generations	2.8 (1.1)a	703	2.0 (1.1)b	207	3.6 (1.1)c	107	3.4 (1.2)c	71
Forestry practices generally produce few long-term negative effects on the environment	2.2 (1.1)a	695	1.6 (1.0)b	207	3.5 (1.3)c	107	3.1 (1.3)c	71
Sustained timber yield								
The present rate of logging is too great to sustain our forests in the future	3.6 (1.1)a	703	4.2 (1.0)b	206	2.6 (1.2)c	108	3.0 (1.4)d	70
There will be sufficient wood in Alberta to meet our future needs	2.6 (1.1)a	698	2.1 (1.1)b	203	3.5 (1.2)c	107	3.3 (1.3)c	71
Enough harvested trees are being replaced by planting new ones or by natural seeding to meet our future timber needs	2.7 (1.1)a	703	2.3 (1.1)b	206	3.9 (1.1)c	108	3.4 (1.2)d	71
Economic development								
The economic benefits from forestry usually outweigh any negative consequences	2.2 (1.1)a	697	1.7 (0.9)b	207	3.0 (1.2)c	107	2.8 (1.4)c	71
Economic stability of communities is more important than setting aside forests from logging	2.2 (1.1)a	699	1.7 (1.0)b	206	3.1 (1.2)c	106	2.7 (1.3)c	70
Public involvement								
Communities that depend on the forest for their economic well-being are given adequate consideration in forest management	3.0 (0.9)a	698	3.3 (1.0)b	205	3.5 (1.0)b	106	3.2 (1.0)ab	71
When making forest decisions, the concerns of communities close to the forest should be given a higher priority than other distant communities	3.5 (1.3)a	706	2.7 (1.3)b	206	4.0 (1.1)c	108	3.8 (1.4)ac	71
The forest industry controls too much of Alberta's forests	3.5 (1.1)a	701	4.3 (1.0)b	207	2.6 (1.4)c	107	2.9 (1.4)c	70
The citizens of Alberta have enough say in forest management	2.3 (1.1)a	703	1.7 (0.9)b	208	3.5 (1.1)c	107	2.8 (1.3)d	71

[a] Rated on a scale of 1 to 5, where 1 = totally disagree and 5 = totally agree.

[b] Any two means in a given row that do not share a letter are significantly different ($p < 0.05$) according to Tukey's highly significant difference test.

Note: RPF = registered professional forester, PAG = forest-industry public advisory group.

future generations, and that forestry produces few long-term negative effects on the environment. The RPFs and PAG members differed substantially from the public and the environmentalists by agreeing with these statements.

The public and the environmentalists did not believe that forest management is producing a sustained timber yield in Alberta. For example, these groups did not agree (mean < 3.0) that there will be sufficient wood to meet our future needs or that enough harvested trees are being replaced to meet our future needs, whereas they agreed (mean > 3.0) that the current rate of logging is too great to sustain our forests. In contrast, RPFs and PAG members had a more optimistic view of timber supply and saw current forest management as providing for future timber needs. These groups agreed that there will be sufficient wood to meet future needs and that enough harvested trees are being replaced to meet those future needs; the RPFs disagreed that the current rate of logging is too great to sustain our forests.

The public, environmentalists, and PAG members disagreed that the economic benefits of forestry outweigh its negative consequences and that the economic stability of communities is more important than setting aside forests from logging. In contrast, the RPFs scored about neutral (mean = 3.0) on these statements. The RPFs and PAG members did not differ significantly from each other, but differed from the public and the environmentalists on these statements. The environmental group had the lowest level of agreement with these statements and differed significantly from the other three groups.

In terms of public involvement, only the RPFs agreed that the citizens of Alberta have enough say in forest management. The RPFs and PAG members felt that the forest industry does not control too much of the province's forests, whereas the public and environmentalists felt that the industry does exert too much control. All groups except the environmentalists agreed that the concerns of communities close to the forest should be given a higher priority in decision making than those of other, more distant communities. The environmental, RPF, and PAG groups agreed that communities that depend on the forest for their economic livelihood are given adequate consideration in forest management. The public rated this statement about neutral. The RPFs and PAG members differed significantly from the public and environmentalists on the following statements: industry controls too much of Alberta's forests, and citizens have enough say in forest management.

Perceived Threats

The public and the environmentalists rated the amount of trees being logged, logging practices, and the amount of forested land allocated for harvesting as the three greatest threats to the province's forests (Table 7). Registered professional foresters perceived influences not related to current forest management practices as posing the

Table 7. Perceived long-term threats to forests among three stakeholder groups[a]

Perceived threat	Mean rating[b] (standard deviation)					
	Public	*n*	Environmentalists	*n*	RPFs	*n*
Forest fires	3.2 (0.9)a	710	2.4 (0.9)b	206	2.9 (1.0)a	109
Amount of trees being logged	3.5 (0.7)a	687	3.7 (0.5)b	205	2.4 (0.9)c	108
Climate change or global warming	2.8 (0.9)a	667	3.1 (0.8)b	199	2.5 (0.8)c	101
Loss of forested land to other purposes such as agriculture or urbanization	3.1 (0.8)a	700	3.4 (0.7)b	205	3.2 (0.8)a	108
Logging practices	3.4 (0.7)a	679	3.6 (0.6)b	205	2.1 (0.7)c	108
Insects and diseases	2.8 (0.7)a	681	2.5 (0.8)b	199	2.7 (0.8)a	109
Amount of forested land in the province allocated for timber harvesting	3.2 (0.7)a	649	3.6 (0.6)b	199	2.4 (0.9)c	107
Amount of recreational use occurring in the forest	2.4 (0.8)a	692	2.6 (0.7)b	204	2.1 (0.8)c	107
Oil and gas exploration and pipelines	2.9 (0.7)a	688	3.3 (0.7)b	204	3.3 (0.7)b	109
Negative publicity about forest management	2.7 (0.9)a	600	2.0 (0.9)b	164	3.1 (0.8)c	104

[a] Rated on a scale of 1 to 4, where 1 = not a threat at all and 4 = a great threat.

[b] Any two means in a given row that do not share a letter are significantly different ($p < 0.05$) according to Tukey's highly significant difference test.

Note: RPF = registered professional forester.

greatest threats. Loss of forested land to other purposes such as agriculture and urbanization, oil and gas exploration and pipelines, and negative publicity about forest management were perceived by RPFs as the greatest threats. Registered professional foresters did not perceive the amount of trees being logged, logging practices, or the amount of forested land allocated for harvesting as posing long-term threats to Alberta's forests (mean < 3.0). The only items perceived by all groups as not being a threat were insects and diseases and the amount of recreation use occurring in the forest. Climate change or global warming was perceived as a threat only by the environmentalists and forest fires only by the public. Public advisory group members were not asked for their perceptions of threats to the forest.

Knowledge of Forests and Forest Management

The RPFs and PAG members were more knowledgeable about forests and forest-related issues than the general public and the environmentalists (Table 8). This is not surprising given that RPFs are trained and educated in most aspects of forest management and PAG members regularly receive substantial information on forest management. The general population was the least informed group, scoring a mean of only 4.5 out of a possible 10 on the knowledge scale. The environmentalists were considerably better informed than the general public but not as well informed as the RPFs or the PAG members. The percentage of respondents who rated themselves as somewhat informed or very informed on forest management issues in Alberta was lowest among members of the general public. About three-quarters of the environmentalists, all of the RPFs, and almost all of the PAG members rated their knowledge of forest issues at these levels.

Foothills Model Forest Residents

The communities in or adjacent to the FMF derive much of their economic base from natural resources. In Hinton, for example, most of the economy depends upon resource extractive activities such as forestry and coal mining. Jasper is heavily dependent on nonextractive natural resource use related to recreation and tourism. We hypothesized that residents of the model forest would differ in their values and attitudes toward forest management because of their dependence on natural resources and their experience with natural resource management. Thus, we divided the general population sample into residents of the model forest (FMF residents), residents of Edmonton and Calgary, the two largest urban centers in the province (Urbanites), and residents in the remainder of the province (Other Residents) and compared the results for these groups.

The Urbanites were younger than the Other Residents group but did not differ in age from the FMF residents (Table 9). The Urbanites were much better educated than the FMF and Other Residents groups. Fewer Urbanites than FMF and Other Residents groups had someone in their household who was dependent on the forest sector for his or her economic livelihood, and fewer Urbanites belonged to a hunting or fishing organization. The groups did not differ in terms of gender, household income, or membership in an environmental or conservation organization.

The distribution of residents among the value segments shows that overall the largest percentage of the general public was in the Moderate Segment, which accounted for about half of each of the FMF residents, the Urbanites, and the Other Residents (Fig. 3). More Urbanites than FMF residents or Other Residents were in the Biocentric Segment. In contrast, more of the FMF and Other Residents groups than the Urbanites were in the Humancentered Segment.

Although FMF residents were similar to the other groups in ranking the environmental benefits of the forest as most important, there were some notable differences. Model forest residents placed greater importance on economic benefits and less importance on environmental and social benefits than the other two groups. Twenty-five percent (33/133) of FMF residents ranked economic benefits as most important compared to 11.2% (27/241) of Urbanites, and 15.7% (45/286) of Other Residents. Seventy percent (94/134) of FMF residents, 85.5% (202/236) of Urbanites, and 81.0% (231/285) of Other Residents ranked environmental benefits as most important. Sixty-three percent (81/129) of FMF residents ranked social benefits such as recreation as least important compared to only 41.4% (95/229) of Urbanites and 54.7% (150/274) of Other Residents.

Overall, FMF residents, Urbanites, and Other Residents appeared to share very similar attitudes. Like other members of the public, FMF residents did not view current forest management as providing an adequate timber supply for the future or, as

Table 8. Knowledge of forests and forest management among stakeholder groups

Knowledge characteristic	Public	*n*	Environmentalists	*n*	RPFs	*n*	PAG members	*n*	*F* value	*p*
Mean composite knowledge score[a] (SD)	4.5 (2.0)a	713	6.2 (2.0)b	209	7.2 (1.4)c	109	7.0 (1.3)c	71	107.79	0.0001
Self-rated knowledge[b]	54.0	690	75.4	203	100.0	108	98.6	70	438.63	0.001

[a] Maximum value 10. Any two means that do not share a letter are significantly different ($p < 0.05$) according to Tukey's highly significant difference test.

[b] Percentage of respondents rating themselves as somewhat or very informed.

Note: RPF = registered professional forester, PAG = forest-industry public advisory group, SD = standard deviation.

Table 9. Socioeconomic characteristics of Foothills Model Forest (FMF) residents, Edmonton and Calgary residents (Urbanites), and Other Residents of Alberta[a]

Characteristic	FMF residents	*n*	Urbanites	*n*	Other Residents	*n*	F/χ^2 value	*p*
Mean age[b] (standard deviation)	45.3 (13.6)ab	144	44.4 (13.5)a	248	47.3 (14.0)b	300	3.38	0.035
Women (%)	48.6	144	49.2	256	54.9	306	2.43	0.296
Some university education (%)	23.1	147	41.9	258	22.1	308	30.01	0.001
Household income ≥ $70 000 (%)	26.5	147	29.1	258	23.7	308	2.10	0.350
Dependent on forest sector (%)	69.0	145	23.4	256	35.9	304	82.51	0.001
Membership in hunting or fishing organization (%)	13.0	138	5.9	256	12.5	303	8.31	0.016
Membership in environmental or conservation organization (%)	15.8	139	11.8	254	9.6	302	3.59	0.166

[a] All respondents in these groups were members of the general public.

[b] Any two means that do not share a letter are significantly different ($p < 0.05$) according to Tukey's highly significant difference test.

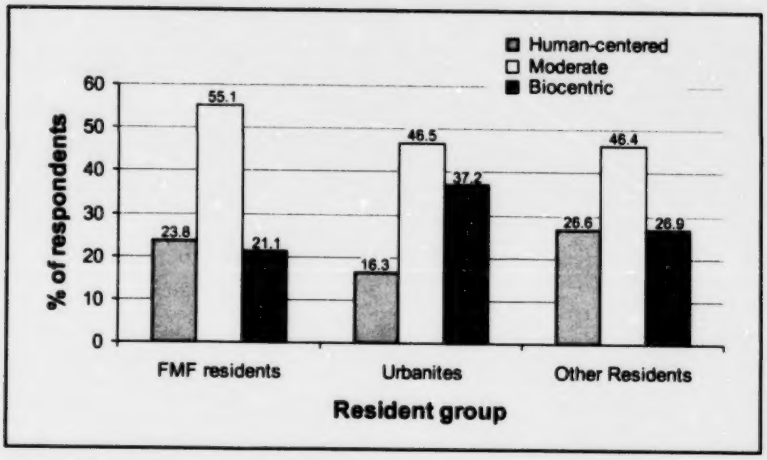

Figure 3. Distribution of forest value segments among subgroups of the general public. FMF = Foothills Model Forest.

successfully managing for a range of values including protected areas and environmental quality, and they did not view public involvement as providing adequate consideration to forest-dependent communities and the citizens of Alberta. The groups differed ($p < 0.05$) on only 2 of the 14 attitudinal statements relating to the sustainability of current management. Foothills Model Forest residents were more in agreement (mean rating = 3.9) than Urbanites (mean rating = 3.3), and Other Residents (mean rating = 3.6) that the concerns of communities close to the forest should be given a higher priority when forest decisions are made. Fewer Urbanites (mean = 2.1) than FMF residents (mean = 2.5) and Other Residents (mean = 2.2) agreed that forestry practices generally produce few long-term negative effects.

Similar to other members of the public, FMF residents rated the amount of trees being logged, logging practices, and the amount of forest allocated for harvesting as the greatest long-term threats. However, FMF residents differed from Urbanites on 5 of the 10 perceived long-term threats to forests (Table 10). Foothills Model Forest residents perceived the amount of trees being logged, loss of forested land to agriculture and urbanization, logging practices, and recreational use as less of a threat but perceived negative publicity about forest management as more of a threat. Foothills Model Forest residents perceived fire as less of a threat than the Other Residents did, while Other Residents perceived climate change as less of a threat than Urbanites did.

Foothills Model Forest residents were more knowledgeable about forests and forestry than Urbanites and Other Residents (Table 10). Foothills Model Forest residents believed that they were better informed about forest issues: 74.1% (106) rated themselves as somewhat or very informed about forest management issues, whereas only 57.1% (64) of Urbanites and 53.1% (231) of Other Residents did so.

DISCUSSION

This study, among the first of its kind in Canada, has demonstrated disparate values and attitudes among some of the primary stakeholders in forest management. In terms of forest values, the RPFs and PAG members were more anthropocentric in their value orientation and placed greater importance on economic benefits than did the public and the environmentalists. The latter groups tended to be more biocentric and to place greater importance on environmental and social benefits than did RPFs and PAG members.

Similarly, there were substantial differences among the groups in terms of attitudes toward

Table 10. Perceived long-term threats to forests and knowledge of forests and forest management within the Alberta public

Perceived threat or knowledge characteristic	Mean rating[a] (standard deviation) FMF	*n*	Urbanites	*n*	Other Residents	*n*
Threats[b]						
Forest fires	3.0 (0.9)a	147	3.1 (0.9)ab	257	3.2 (0.9)b	306
Amount of trees being logged	3.3 (0.8)a	147	3.6 (0.6)b	245	3.4 (0.7)ab	295
Climate change or global warming	2.8 (0.9)ab	139	2.9 (0.8)a	247	2.7 (0.9)b	281
Loss of forested land to other purposes such as agriculture or urbanization	3.0 (0.9)a	144	3.3 (0.8)b	256	3.0 (0.9)ab	300
Logging practices	3.2 (0.8)a	145	3.4 (0.7)b	240	3.3 (0.7)ab	294
Insects and diseases	2.9 (0.7)	139	2.8 (0.7)	253	2.8 (0.7)	289
Amount of forested land in the province allocated for timber harvesting	3.1 (0.8)	144	3.2 (0.7)	230	3.2 (0.8)	275
Amount of recreational use occurring in the forest	2.2 (0.7)a	145	2.5 (0.8)	249	2.4 (0.8)ab	298
Oil and gas exploration and pipelines	2.8 (0.8)	146	3.0 (0.7)	245	2.9 (0.7)	297
Negative publicity about forest management	3.0 (0.9)a	129	2.7 (1.0)b	224	2.7 (0.9)ab	247
Knowledge						
Composite knowledge score[c]	5.4 (1.9)a	147	4.3 (2.1)b	258	4.7 (1.9)b	308
Self-rated knowledge[d]	2.8 (0.7)a	143	2.4 (0.8)b	249	2.5 (0.8)ab	298

[a] Any two means in a given row that do not share a letter are significantly different ($p < 0.05$) according to Tukey's highly significant difference test.

[b] Rated on a scale of 1 to 4, where 1 = not a threat at all and 4 = a great threat.

[c] Maximum value 10.

[d] Rated on a four-point scale where 1 = not at all informed and 4 = very well informed.

Note: FMF = Foothills Model Forest, Urbanites = residents of Calgary and Edmonton.

aspects of sustainable forest management. Generally, RPFs and PAG members had an optimistic view of the sustainability of timber supply, the successful inclusion of multiple values in forest management, and the adequacy of public involvement, and placed more importance on economic aspects of sustainability. The public and environmentalists did not share this optimism, which suggests a lack of confidence in current management. This lack of confidence was also evident in what the public and the environmentalists viewed as the most serious long-term threats to forests in the province. Threats related to forestry operations, such as the amount of trees being logged and the amount of land allocated for timber harvesting, were seen by these groups as the greatest threats. In other words, the public and the environmentalists viewed decisions being made by forest managers as the greatest threats to the province's forests. Registered professional foresters and PAG members did not view these as posing a threat. Indeed, these groups viewed the greatest threats as coming from outside the forest industry: the oil and gas industry, agriculture and urbanization, and negative publicity.

Our findings are consistent with those of other studies, which found differences in forest values and preferences among forest managers, the general public, and environmental groups. Such differences have been cited as underlying factors in stakeholder conflicts (Vining and Ebero 1991; Wagner et al. 1998; Kearney et al. 1999). Differences in values and attitudes might explain some of the recent conflict in many parts of Canada. For example, the court challenge to forestry operations in southwestern Alberta (Thomas 1998) and the Clayoquot Sound protests in British Columbia (Friends of Clayoquot Sound 1998) are probably manifestations of underlying differences in values and attitudes. The similarity of values and attitudes between the public and the environmentalists in this study suggests an underlying public sympathy toward environmental groups that challenge the forest industry.

Despite the high level of concern over the sustainability of forest management, neither the public nor the environmentalists were opposed to using forests to add to the quality of human life. It appears, then, that is not the use of forests per se but the specific management goals or how to achieve them that constitute the subject of disagreement over how well the forests are managed.

The differences in knowledge among the stakeholder groups suggests that attitudes related to sustainability could be addressed, at least in part, through communications, especially those directed at the public. Although several efforts are being made by industry (e.g., Logan 1999) and the FMF (Foothills Model Forest 2000) to inform the public about forest research and sustainable management practices, the public was the least knowledgeable group in this study, and members of this group rated themselves as the least informed on forest issues. Communication between current forest decision makers and the public should consider several things.

First, forest value orientations are deeply held and difficult to change. Therefore, communications should not be directed at trying to change held values. Rather they should explain how values held by the public and environmental groups are currently incorporated into management practices. Registered professional foresters should be aware that the public is more sensitive than they themselves are to biocentric values, environmental quality, and social benefits such as recreation. Communicating aspects of forest management that address environmental quality and protection measures, non-use values such as the inherent worth of forests, respect for forests and natural processes, spiritual values would likely be well received by the public. Registered professional foresters whose values differ from those of the public might think that information on the economic consequences of management will be sufficient to set goals and justify management decisions. However, economic arguments alone will not likely be convincing to the public. Until management includes biocentric values to the satisfaction of the public and until the inclusion of these values is communicated, perceptions of unsustainable management and divisions among stakeholders will continue. The successful inclusion and communication of the public's values into forest management should ultimately result in a change in attitudes toward forest management and subsequently should be manifested by a more optimistic view on the part of the public of the sustainability of forest management and a reduction in stakeholder conflicts.

Second, the Canadian public perceives the forest industry as a "low-tech" industry.[1] Assumptions that the public understands that science is the basis for forest management decisions may be incorrect (Wagner et al. 1998). The scientific rationale behind management decisions and the diverse range of current research to help manage for diverse values, including environmental and social values, must be communicated. The principles of ecosystem management, such as managing for biodiversity and historic, cultural and recreational resources and emulating natural processes, that have been adopted by the provinces and the forest industry (Alberta Environmental Protection 2000) must also be communicated.

Third, providing factual information alone will not produce the desired change in attitudes. For example, although the environmentalists in the current study had a relatively high level of knowledge, this knowledge did not translate into positive attitudes toward forest management or the forest industry. Effective, persuasive communication is a complex process that requires an understanding of communication theory, initial attitudes, information on demographics and knowledge gaps of the audience, the most effective media, the perceived credibility of the communicator, and other factors (Manfredo 1992).

This study has important implications for public involvement in forest management. First, RPFs viewed communities dependent on forests for their economic livelihood and the citizens of Alberta as already having adequate consideration and input into forest management. This suggests that forest managers responsible for management and policy decisions and public-involvement strategies may not be receptive to including a broader public (i.e., diverse stakeholders) or undertaking a wider range of public-involvement mechanisms. Managers must recognize that their views on public involvement and the sustainability of current management may result in a tendency to dismiss public concerns as unwarranted. In addition, relying on PAGs as the primary mechanism for public involvement in the forest industry suggests that other publics and their values and concerns are not being addressed. Public advisory group members shared values and attitudes with the RPFs and differed substantively from the general public in this respect. This may, in part, be due to the exchange of information between RPFs and PAG members. Those knowledgeable and familiar with forest management (the RPFs) provide

[1] Corporate Research Associates Inc. 1997. Tracking survey of Canadian attitudes towards natural resource issues. Prepared for Nat. Resour. Can., Halifax, NS. Unpublished manuscript.

information to and educate PAG members on various aspects of a company's forest management plans and activities. Public advisory group members, in turn, provide feedback and express concerns. The similarities between RPFs and PAG members might be the result of this education process.

Second, residents of forest-dependent communities such as those in the FMF may not differ as substantively from the broader public as is commonly believed. Urban residents were younger, had higher levels of education, and seemed more biocentric in their value orientations, whereas model forest residents ranked economic benefits as more important. However, the two groups shared similar attitudes and generally had a negative view of forest management. There appear to be more similarities than differences between residents of the model forest and residents outside the model forest.

Third, it appears that survey research can provide another mechanism to reach a broad public and numerous stakeholders who might not be represented in more traditional forms of public involvement. Examining values and attitudes can help managers to understand underlying differences among stakeholders. The development of tools such as the values scale used in this study provides a basis for obtaining public input on broadly defined management goals and priorities and periodically monitoring stakeholder values. The use of standardized measures and quantification of values represents another tool that can be used to supplement current mechanisms for public involvement.

Future analyses of the data collected in this study will include multivariate analysis to examine the influence of socioeconomic factors such as age, education, gender, income, and place of residence and social influence factors such as membership in an environmental organization or employment as an RPF on values and attitudes. Such analyses will assist in identifying factors that can be used to predict values and attitudes over time.

Although this study has yielded information on the values and attitudes of specific stakeholders in Alberta, it has not examined the trade-offs that people are willing to accept in order to manage for particular values and preferences. Trade-off analysis can provide insight into the relative importance of management actions or policies by presenting stakeholders with realistic choices between economic realities and less tangible forest outputs. This type of analysis can provide public input into the decisions faced by forest managers and policymakers and should be addressed in future research.

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